APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Steven D. Kloos et al. Examiner: Krishnan S. Menon

Serial No.: 10/516,579 Group Art Unit: 1797

Filed: April 21, 2005 Docket: 1330.012US1

For: MEMBRANE DEVICES AND DEVICE COMPONENTS

APPEAL BRIEF UNDER 37 CFR § 41.37

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Appeal Brief is presented in support of the Notice of Appeal to the Board of Patent Appeals and Interferences, filed on March 30, 2009, from the Final Rejection of claims 74-92 of the above-identified application, as set forth in the Final Office Action mailed on January 17, 2009.

The Commissioner of Patents and Trademarks is hereby authorized to charge Deposit Account No. 19-0743 in the amount of $540.00 which represents the requisite fee set forth in 37 C.F.R. § 41.20(b)(2). The Appellants respectfully request consideration and reversal of the Examiner's rejections of pending claims.

1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, GE OSMONICS, INC.

2. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant that will have a bearing on the Board's decision in the present appeal.

3. STATUS OF THE CLAIMS

The present application was filed on April 21, 2005 with claims 1-73. A non-final Office Action was mailed November 7, 2007. A Final Office Action was mailed April 18, 2008. In the response to Final Office Action filed with a Request for Continued Examination on June 6, 2008, claims 1-73 were cancelled and new claims 74-88 were added. A non-final Office Action was mailed June 26, 2008. In the response to non-final Office Action filed on November 26, 2008, new claims 89-92 were added. A Final Office Action was mailed December 31, 2008. Claims 74-92 stand finally rejected, remain pending, and are the subject of the present Appeal.

4. STATUS OF AMENDMENTS

No amendments have been made subsequent to the Final Office Action dated December 31, 2008.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Aspects of the present inventive subject matter include, but are not limited to, membrane devices and device components.

INDEPENDENT CLAIM 74

FIG. 1 and page 5, lines 25-34 show and describe an example membrane element 100. The membrane element includes a first thin film composite membrane sheet 106 and a second thin film composite membrane sheet 108. The membrane element 100 further includes a feed carrier that is used as a permeate carrier 110. The permeate carrier 110 separates the first thin film composite membrane sheet 106 and the second thin film composite membrane sheet 108. The permeate carrier 110 has an H-value of about 0.045 atm-sec/gm or less (see, e.g., page 9, lines 6-13). The membrane element 100 is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F (see, e.g., page 9, lines 15-20).

INDEPENDENT CLAIM 89

FIG. 1 and page 5, lines 25-34 show and describe an example membrane element 100. The membrane element 100 includes a first thin film composite membrane sheet 106 and a second thin film composite membrane sheet 108. The membrane element 110 further includes a permeate carrier 110 that separates the first thin film composite membrane sheet 106 and the second thin film composite membrane sheet 108. The permeate carrier 110 has an H-value of about 0.045 atm-sec/gm or less (see, e.g., page 9, lines 6-13). In addition, the permeate carrier 110 has a void volume greater than 50 percent (see, e.g., page 12, line 17 through page 13, line 10). The membrane element 110 is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F (see, e.g., page 9, lines 15-20).

This summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to each of the appended claims and its legal equivalents for a complete statement of the invention.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 89-92 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

Claims 74-92 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention.

Claims 74-92 were rejected under 35 U.S.C. 103(a) as being obvious over the combination of Uhlinger (U.S. Patent No. 6,190,556) and Lien (U.S. Patent No. 4,802,982).

7. ARGUMENT

A) The Applicable Law under 35 U.S.C. §112, first paragraph

As described in MPEP § 2164 et seq., the following represents the *prima facie* case that the Examiner must provide in order to maintain a rejection of nonenablement with respect to the disclosure of a patent application under 35 U.S.C. § 112, first paragraph:

1. a rational basis as to
    a. why the disclosure does not teach, or
    b. why to doubt the objective truth of the statements in the disclosure that purport to teach;
2. the manner and process of making and using the invention;
3. that correspond in scope to the claimed invention;
4. to one of ordinary skill in the pertinent technology;
5. without undue experimentation; and
6. dealing with subject matter that would not already be known to the skilled person as of the filing date of the application.

B) Discussion of the rejection of claims 89-92 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

Since the Examiner has not provided evidence supporting each of these elements, the Examiner has not made out a *prima facie* case for nonenablement under 35 U.S.C. § 112, first paragraph.

Further, Appellant respectfully submits that the specification does provide enablement commensurate with the scope of claims 89-92 for the following reasons. Appellant's specification at FIG. 1 and page 5, lines 25-34 describes:

> ". . . a schematic cross-section of a portion of a membrane device 100 according to one embodiment. Membrane device 100 includes a sheet 102 to supply feed solution and a leaf structure 104 which includes a pair of membranes 106 and 108 sandwiching a permeate carrier 110. The pair of membranes can be two separate membranes or a single membrane folded upon itself. Flow of a solution is indicated by the arrows, with solution entering the feed sheet 102, permeate going through membrane 108 into permeate carrier 110 and unfiltered concentrate

> continuing through sheet 108. Membrane device 100 can be used in a spiral wound configuration, a plate and frame configuration, and other similar configurations."

In addition, Appellants' specification at page 9, lines 6-13 describes the permeate carrier 110 having an H-value of about 0.045 atm-sec/gm or less. Appellants' specification at page 12, line 17 through page 13, line 10 also describes the permeate carrier 110 having a void volume greater than 50 percent (see, e.g., the identified NALTEX layers that are used as a permeate carrier in Appellants' invention). Appellants also refer to page 9, lines 15-20 of Appellants' specification which describes:

> "Membrane devices made with such permeate carriers give improved performance in RO applications where a substantial amount of salt is retained by a membrane. Herein, a substantial amount of salt retained is when a membrane device is capable of at least 50% $MgSO_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F."

These portions of the figures and specification, among others, enable a person of ordinary skill in the art to make and use the invention commensurate with the scope of claims 89-92.

C) The Applicable Law under 35 U.S.C. §112, second paragraph

The Board of Patent Appeals and Interferences has stated:

> In rejecting a claim under the second paragraph of 35 U.S.C.§112, it is incumbent on the examiner to establish that one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification, would not have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims. *Ex parte* Wu, 10 USPQ 2d 2031, 2033 (B.P.A.I. 1989)(citing *In re* Moore, 439 F.2d 1232, 169 USPQ 236 (C.C.P.A. 1971); *In re* Hammack, 427 F.2d 1378, 166 USPQ 204 (C.C.P.A. 1970)).

The M.P.E.P. adopts this line of reasoning, stating that:

> The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:
>
> (1) The content of the particular application disclosure;
>
> (2) The teachings of the prior art; and

(3) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. *M.P.E.P.* § 2173.02.

D) Discussion of the rejection of claims 74-92 under 35 U.S.C. 112, second paragraph, as failing to comply with the written description requirement.

The Final Office Action states at pages 2-3 that "claims recite interalia H-values and void volumes of a permeate carrier without reciting any specific structure and membrane having a capacity to reject MgSO4 to >50%. Of these, the MgSO4 rejection is a membrane characteristic independent of the H-value or the void volume."

Appellant respectfully disagrees for at least three reasons. First, Appellant respectfully submits that claims 74 and 89 do recite a specific structure (i.e., a permeate carrier) and further define the structure of the permeate carrier by reciting an H-value and void volume (claim 89). Second, the permeate carrier is further defined as a feed spacer (claim 74). Finally, the salt rejecting capability is dependent on the H-value and void volume of the permeate carrier (see application disclosure at page 10, lines 1-8 and page 13, lines 12-20). Appellant notes that the application disclosure at page 5, lines 25-34; page 9, lines 6-13 and 15-20; and page 12, line 17 through page 13, line 10 describes all of the elements of claims 74 and 89.

Therefore, Appellant respectfully submits that the claim language, when analyzed in light of the content of the application disclosure, is not indefinite.

E) The Applicable Law under 35 U.S.C. §103(a)

To sustain a rejection under 35 U.S.C. 103, references must be cited that teach or suggest all the claim elements. M.P.E.P. § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983); *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985); MPEP § 2141.02.

The teaching or suggestion to make the claimed combination and the reasonable

expectation of success must both be found in the prior art, not in Appellant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); MPEP § 2143. The Examiner must avoid hindsight. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990).

F) Discussion of the rejection of claims 74-92 under 35 U.S.C. 103(a) as being obvious over the combination of Uhlinger (U.S. Patent No. 6,190,556) and Lien (U.S. Patent No. 4,802,982).

Appellant respectfully submits that the cited combination of references does not include any objective evidence as to a membrane element that includes first and second thin film composite membrane sheets which are separated a permeate carrier that has an H-value of about 0.045 atm-sec/gm or less such that the membrane element is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F as recited in claims 74 and 89. In addition, Appellant respectfully submits that the cited combination of references does not include any objective evidence as to a permeate carrier having a void volume greater than 50 percent as recited in claim 89.

Lien

Appellant initially notes that Lien describes ultra-filtration membranes such that Lien does not disclose first and second thin film composite membrane sheets as recited in claims 74 and 89. In addition, Lien does not describe or even contemplate salt rejection by the disclosed ultra-filtration membranes.

As part of making the rejection, the Examiner states at page 5 of the Final Office Action that Lien "…teaches how to optimize these factors (see columns 7-9, tables and working examples)." The Examiner further states at page 5 of the Final Office Action that it would be obvious to "…use the teachings of Lien '982 in the teaching of Uhlinger '556 to optimize the membrane device design of the desired performance."

Appellant respectfully traverses these assertions because Appellant submits that while Lien describes a number of generic formulae for optimizing a system under some different parameters, Lien does not describe a permeate carrier and first and second membranes *as recited*

in the claims. Specifically, Lien fails to teach "…a permeate carrier having an H-value of about 0.045 atm-sec/gm or less, wherein the membrane device is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F." Appellant notes that the examples in Lien are at various temperatures other than 77 degrees F.

Appellant submits that even if the values that are recited in claims 74 and 89 were used in the each of the generic formulae disclosed in Lien, there is no indication that the disclosed formulae would accurately apply values of claims 74 and 89. As an example, there is description where 65 psi is the applied pressure at 10 cm/s average feed channel cross-flow velocity in combination with the other values recited in claim 74.

As stated in Appellants' specification, the improved thin film composite membrane elements in this invention not only show improved efficiencies which yield higher flow rates they also surprisingly show improved salt rejection rates. Lien does not contemplate that improved permeate channels would lead to improved membrane salt rejection rates.

Uhlinger

Appellant notes that Uhlinger describes conventional membrane elements such that Uhlinger does not disclose a permeate carrier that has an H-value of about 0.045 atm-sec/gm or less as recited in claims 74 and 89. Appellant notes that the membrane elements which are disclosed in Uhlinger suffer from all of the drawbacks that are associated with conventional membrane elements (see Appellant's spec. at page 3, lines 13-30; page 4, lines 5-20; page 7, line 25 through page 8, line 4; and page 8, lines 9-10).

Appellants submits that claims 74 and 89 recite a non-obvious combination of first and second thin film composite membrane sheets which are separated a permeate carrier that has an H-value of about 0.045 atm-sec/gm or less such that the membrane element is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F. The claimed membrane element meets the long felt need of a high flow membrane element that improves salt rejecting capability during relatively low pressure operation (see Appellant's spec. at page 4, line 21 through page 5, line 5; page 15, lines 6-20; and page 16, lines 13-19). In addition, the use of a permeate carrier that has

an H-value of about 0.045 atm-sec/gm or less to separate first and second thin film composite membrane sheets provided unexpected and superior results (see Appellant's spec. at page 8, lines 10-20; page 9, lines 15-20; and page 12, line 28 through page 13, line 20) over conventional membrane elements.

Appellants submit that the A-values in column 2, lines 1-10 of Uhlinger give reverse osmosis and nanofiltration A-values of about 7.6. Uhlinger mentions gfd/psi value of 0.11. Using an arbitrary pressure of 100 psi would therefore yield a flux of 11 gfd. This translates to an A-value of 7.6 (where the units of A-value are $10^{-5}cm^3/(cm^2*atm)$). A simple conversion is:

A-value (in units of $10^{-5}cm^3/(cm^2*atm)$) = [gfd * 69.3]/psi

Where psi is the driving pressure at the membrane surface (i.e., no osmotic pressure can be included).

Appellant notes that the A values disclosed in Uhlinger of 7.6 or less are below the value of 25 as recited in claim 79. In addition, following the teachings of Uhlinger would give much higher H values than those recited in the claims.

The Examiner further states at page 6 of the Final Office Action that "Void volumes of the carrier materials are inherently in the range claimed: see the description of Conwed or Nalle materials in column 6, line 15 – column 7, line 6 of Lien, which are also similar to the typical feed spacer used in the spiral wound construction of the membrane cartridges." In addition, the Examiner states at pages 6-7 of the Final Office Action that "the teaching of Lien does describe that typical feed spacer material supplied by Conwed or Nalle Plastics as permeate carrier. Compare the definition of the permeate carrier preferred as 12 mil thick, having parallel thick strands 92 interconnected with fibrils 94 and the H values in table 2, with applicant's disclosed carrier materials. **Thus the teaching of Lien inherently anticipates the claims.**" Appellant respectfully traverses these assertions as it does not appear that any of the portions of Lien which were cited by the Examiner describe "the permeate carrier having a void volume greater than 50 percent" as recited in claim 89.

Appellants note that it is Appellants' specification which provides the only objective evidence of using thin film composite membranes in combination with a permeate carrier that

has such a low flow resistance. This novel and non-obvious combination results in a membrane element that has unexpected flow rates and improved salt rejecting capability.

Therefore, Appellant respectfully traverses the rejection because Appellant submits that not all of the elements are established by the cited references. According to the MPEP § 2142 the prior art must teach or suggest all the claim limitations. The references cited by the Examiner simply do not describe a permeate carrier and first and second membranes as recited in the claims.

Applicant notes that the claims recite an RO membrane that has very low H values which have never existed before at the recited pressures. In addition, the Examiners statements that the salt rejection is independent of the H value is not correct. The salt rejection as recited in the claims was an unexpected result at the recited pressures.

As part of making the rejection, the Examiner further states at page 7 of the Final Office Action that "No supporting evidence could be found on the long felt need and unexpected results as argued, Appellant has failed to show any such evidence." Appellant respectfully traverses these assertions because Appellant's specification documents the long felt need which existed and the unexpected results that occurred as a result of Appellant's invention (see again Appellant's spec. at page 3, lines 13-30; page 4, lines 5-20; page 7, line 25 through page 8, line 4; and page 8, lines 9-10 and 10-20; page 9, lines 15-20; and page 12, line 28 through page 13, line 20)).

SUMMARY

For the reasons argued above, claims 74-92 were not properly rejected under § 112 and § 103. It is respectfully submitted that the art cited does not render the claims obvious and that the claims are patentable over the cited art. Reversal of the rejections and allowance of the pending claims are respectfully requested.

Respectfully submitted,

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Date July 30, 2009 By /Andrew Peret/
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 30 day of July 2009.

John D. Gustav-Wrathall
Name

/John D. Gustav-Wrathall/
Signature

8. CLAIMS APPENDIX

74. A membrane element comprising:

a first thin film composite membrane sheet;

a second thin film composite membrane sheet; and

a feed carrier that is used as a permeate carrier, the permeate carrier separating the first thin film composite membrane sheet and the second thin film composite membrane sheet, the permeate carrier having an H-value of about 0.045 atm-sec/gm or less, wherein the membrane element is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F.

75. The membrane element of claim 74, wherein the H-value is about 0.035 atm-sec/gm or less.

76. The membrane element of claim 74, wherein the thickness of the permeate carrier is approximately 0.025 inches or less.

77. The membrane element of claim 74, wherein the thickness of the permeate carrier is approximately 0.020 inches or less

78. The membrane element of claim 74, wherein the thickness of the permeate carrier is approximately 0.015 inches or less

79. The membrane element of claim 74, wherein the A value of each of the first membrane sheet and the second membrane sheet is less than about 15.

80. The membrane element of claim 74, wherein the A value of each of the first membrane sheet and the second membrane sheet is between about 15 – 30.

81. The membrane element of claim 74, wherein the A value of each of the first membrane sheet and the second membrane sheet is between about 30 – 50.

82. The membrane element of claim 74, wherein the A value of each of the first membrane sheet and the second membrane sheet is greater than about 50.

83. The membrane element of claim 74, wherein the first thin film composite membrane sheet and the second thin film composite membrane sheet define a leaf.

84. The membrane element of claim 83, wherein the leaf has a length of approximately 3 feet or less.

85. The membrane element of claim 83, wherein the leaf has a length of approximately 3 feet to 5 feet.

86. The membrane element of claim 83, wherein the leaf has a length of approximately 5 feet or greater.

87. The membrane element of claim 74, wherein the membrane element is capable of at least 90% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F.

88. The membrane element of claim 74, wherein the membrane element has a spiral wound configuration with an outer diameter of approximately 3.25 inches or less.

89. A membrane element comprising:

a first thin film composite membrane sheet;

a second thin film composite membrane sheet; and

a permeate carrier separating the first thin film composite membrane sheet and the second thin film composite membrane sheet, the permeate carrier having an H-value of about 0.045 atm-

sec/gm or less, the permeate carrier having a void volume greater than 50 percent, wherein the membrane element is capable of at least 50% $MgS0_4$ rejection of 500 ppm $MgSO_4$ in DI water at 65 psi applied pressure at 10 cm/s average feed channel cross-flow velocity at 77 degrees F.

90. The membrane element of claim 89, wherein the permeate carrier having a void volume greater than 60 percent.

91. The membrane element of claim 89, wherein the permeate carrier having a void volume greater than 70 percent.

92. The membrane element of claim 89, wherein the permeate carrier having a void volume greater than 80 percent.

9. EVIDENCE APPENDIX

None.

10. RELATED PROCEEDINGS APPENDIX

None.